

ABSTRACT OF THE DISCLOSURE

A laser sintering method and apparatus has a material on a substrate. A laser is used for completely sintering the material and enhancing adhesion of the material to the substrate without damaging the substrate. Any computing device may receive and process data and automatically control the sintering operation. A protective layer may be provided on the substrate. The substrate may be a low temperature substrate and the protective layer may be a protective thermal barrier which prevents damage to the substrate during sintering and also enhances adhesion of the material to the substrate. The substrate, the material, and the protective thermal barrier may be formed as an electronic component. A feedback control system coupled to the computer provides information to the computer for processing and controlling output of the laser. The material on the substrate may have any shape. The substrate may also have any shape.

Table I
Absorbance (in Percent) for Various Materials
at Various Wavelengths of Light

Laser Type	XeCl Excimer	Nd:YAG	CO ₂
Wavelength	308 nm	1.06 μm	10.6 μm
<i>Metals</i>			
Silver (Ag)	90%	2-3%	1%
Gold (Au)	62%	2-3%	1%
Copper (Cu)	75%	10%	2%
Platinum (Pt)	60%	20%	4%
Palladium (Pd)	58%	26%	4%
<i>Metal Oxides</i>			
Silica (SiO ₂)	2-90%	2-4%	>90%
Titania (TiO ₂)	>90%	30%	>90%
Alumina (Al ₂ O ₃)	85%	1-10%	90%

Table II
Material Properties for RTP Simulation

Material	Conductivity (W/m-K)	Specific Heat (J/kg-K)	Density
Aerogel	10.0	981	221
Silver	$f_1(T)$	235	10,500
Silicon	$f_2(T)$	702	2,330

where

$$f_1(T) = 425 + 0.07T - 0.0002T^2 + 1.03 \times 10^{-7}T^3 + 1.03 \times 10^{-11}T^4 - 1.72 \times 10^{-14}T^5$$

and;

$$f_2(T) = 445 - 1.65T + 0.0028T^2 - 2.4 \times 10^{-6}T^3 + 1.0 \times 10^{-9}T^4 - 1.37 \times 10^{-13}T^5$$